

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

1-16. (Canceled)

17. (Currently Amended) A stage assembly for manufacturing semiconductor wafers, comprising:

a stage to position at least one substrate, the stage being moved by a force generator in response to a wafer manufacturing control system;

a base having an upper side supporting the stage, the base being allowed to move in response to a reaction force generated by the force generator;

at least one bearing having a plurality of pressurized air layers to support the base allowing the base to move relative to a stationary surface; and

at least one actuator to control movement of the base, the movement being caused by at least one of a disturbance force and the reaction force, the at least one actuator comprising an actuator disposed adjacent to a side outer surface of the base to generate a correction torque about an axis perpendicular to the upper side of the base.

18. (Original) The stage assembly of claim 17, wherein the stage and the base move in opposite directions and travel inversely proportionate distances corresponding to a stage mass and a base mass.

19. (Original) The stage assembly of claim 18, wherein a combined center of gravity of the stage and the base remains stationary.

20. (Original) The stage assembly of claim 17, wherein the at least one bearing comprises one of a plurality of pneumatic bearings, magnetic bearings, and mechanical bearings, and a combination thereof.

21. (Original) The stage assembly of claim 20, wherein the plurality of pneumatic bearings comprise:

a first layer of pressurized air to allow the base to move linearly along a first axis and a second axis, and to rotate around a third axis, the first, second, and third axes being orthogonal to each other.

22. (Original) The stage assembly of claim 21, wherein the plurality of pneumatic bearings further comprise:

a second layer of pressurized air to allow a top flat surface of each of the plurality of pneumatic bearings to conform to an undersurface of the base.

23. (Original) The stage assembly of claim 17, wherein the at least one actuator comprises one of a plurality of voice-coil motors, planar motors, linear motors, rotary motors with linkages, springs, dampers, and a combination thereof.

24. (Original) The stage assembly of claim 17, further comprising:

a sensor to detect at least one of an actual position, an actual velocity, and an actual acceleration of the base.

25. (Original) The stage assembly of claim 24, further comprising:
a control system to determine an error signal for the at least one actuator to generate a correction force to cancel the at least one of the disturbance force and the reaction force.

26. (Original) The stage assembly of claim 25, wherein the error signal is calculated based on a discrepancy between at least one of the actual position, the actual velocity and the actual acceleration, and a corresponding predetermined position, predetermined velocity, and predetermined acceleration of the base.

27. (Original) The stage assembly of claim 17, wherein the base has at least one degree of freedom, and the at least one actuator is capable of constraining the movement of the base in at least one degree of freedom.

28. (Original) The stage assembly of claim 27, wherein the at least one actuator comprises:
a first actuator disposed adjacent to the base to generate a first correction force.

29. (Original) The stage assembly of claim 28, wherein the at least one actuator further comprises:

a second actuator disposed adjacent to the base to generate a second correction force.

30. (Canceled)

31. (Original) The stage assembly of claim 29, wherein the first actuator generates the first correction force acting in a first direction, and the second actuator generates the second correction force acting in a second direction.

32. (Previously presented) The stage assembly of claim 29, wherein the first actuator generates the first correction force acting in a first direction passing through a center of gravity of the base, and the second actuator generates the second correction force acting in a second direction passing through the center of gravity of the base, and the actuator disposed adjacent to the side outer surface of the base generates the correction torque around a third direction.

33. (Original) A projection lens assembly comprising the stage assembly of claim 17.

34. (Original) An object on which an image has been formed by the projection lens assembly of claim 33.

35. (Original) A lithography system comprising the projection lens assembly of claim 33.

36. (Currently Amended) A stage assembly for manufacturing semiconductor wafers, comprising:

a stage to position at least one substrate, the stage being moved in accordance with a wafer manufacturing control system;

a base having an upper side supporting the stage, the base being allowed to move in response to a reaction force generated by a movement of the stage:

at least one bearing having a plurality of pressurized air layers to allow the base to levitate above a stationary surface; and

at least one actuator to control movement of the base, the movement being caused by at least one of a disturbance force and the reaction force, the at least one actuator comprising an actuator disposed adjacent to a side outer surface of the base to generate a correction torque about an axis perpendicular to the upper side of the base.

37. (Original) The stage assembly of claim 36, wherein the stage and the base move in opposite directions traveling inversely proportionate distances corresponding to a stage mass and a base mass.

38. (Original) The stage assembly of claim 37, wherein a combined center of gravity of the stage and the base remains stationary.

39. (Previously presented) The stage assembly of claim 36, wherein the at least one bearing comprises:

one of a plurality of pneumatic bearings, magnetic bearings, and mechanical bearings, and a combination thereof.

40. (Original) The stage assembly of claim 39, wherein the plurality of pneumatic bearings comprise:

a first layer of pressurized air to allow the base to move linearly along a first axis and a second axis, and to rotate around a third axis, the first, second, and third axes being orthogonal to each other.

41. (Original) The stage assembly of claim 40, wherein the plurality of pneumatic bearings further comprise:

a second layer of pressurized air to allow a top flat surface of each of the plurality of pneumatic bearings to conform to an undersurface of the base.

42. (Original) The stage assembly of claim 36, wherein the at least one actuator comprises:

one of a plurality of voice-coil motors, planar motors, linear motors, rotary motors with linkages, springs, dampers, and a combination thereof.

43. (Original) The stage assembly of claim 36, further comprising:
at least one sensor to detect at least one of an actual position, an actual velocity, and an actual acceleration of the base.

44. (Original) The stage assembly of claim 43, further comprising:

a control system to determine an error signal for the at least one actuator to generate at least one of a correction force and a correction torque to control the position of the base.

45. (Original) The stage assembly of claim 44, wherein the error signal is calculated based on a discrepancy between at least one of the actual position, the actual velocity and the actual acceleration, and a corresponding predetermined position, predetermined velocity, and predetermined acceleration of the base.

46. (Original) The stage assembly of claim 36, wherein the base has at least one degree of freedom, and the at least one actuator is capable of constraining the movement of the base in at least one degree of freedom.

47. (Original) The stage assembly of claim 46, wherein the at least one actuator comprises:

a first actuator disposed adjacent to the base to generate a first correction force

48. (Original) The stage assembly of claim 47, wherein the at least one actuator further comprises:

a second actuator disposed adjacent to the base to generate a second correction force.

49. (Canceled)

50. (Original) A projection lens assembly comprising the stage assembly of claim 36.

51. (Original) An object on which an image has been formed by the projection lens assembly of claim 50.

52. (Original) A lithography system comprising the projection lens assembly of claim 50.

53-75. (Canceled)

76. (Original) The stage assembly system of claim 36, wherein the at least one actuator comprises a first unit connected to the base and a second unit connected to the stationary surface, the second unit being connected to the first unit magnetically.

77. (Original) The stage assembly of claim 76, wherein the at least one actuator generates a driving force by utilizing a magnetic field.

78. (Original) The stage assembly of claim 77, wherein the at least one actuator generates a driving force by utilizing a Lorentz force.

79. (Original) The stage assembly of claim 78, wherein the at least one actuator comprises one of a voice coil motor, a planar motor, and a linear motor.

80. (Previously presented) A stage assembly for manufacturing semiconductor wafers, comprising:

a stage to position at least one substrate, the stage being moved by a force generator in response to a wafer manufacturing control system;

a base supporting the stage, the base being allowed to move in response to a reaction force generated by the force generator;

a plurality of pneumatic bearings to support the base allowing the base to move relative to a stationary surface, the plurality of pneumatic bearings comprising a first layer of pressurized air to allow the base to move linearly along a first axis and a second axis, and to rotate around a third axis, the first, second, and third axes being orthogonal to each other, and a second layer of pressurized air to allow a top flat surface of each of the plurality of pneumatic bearings to conform to an undersurface of the base; and

at least one actuator to control movement of the base, the movement being caused by at least one of a disturbance force and the reaction force.

81. (Previously presented) A stage assembly for manufacturing semiconductor wafers, comprising:

a stage to position at least one substrate, the stage being moved in accordance with a wafer manufacturing control system;

a base supporting the stage, the base being allowed to move in response to a reaction force generated by a movement of the stage;

a plurality of pneumatic bearings to allow the base to levitate above a stationary surface, the plurality of pneumatic bearings comprising a first layer of pressurized air to

allow the base to move linearly along a first axis and a second axis, and to rotate around a third axis, the first, second, and third axes being orthogonal to each other, and a second layer of pressurized air to allow a top flat surface of each of the plurality of pneumatic bearings to conform to an undersurface of the base; and

at least one actuator to control movement of the base, the movement being caused by at least one of a disturbance force and a reaction force.

82. (New) A stage assembly comprising:

a stage that retains a substrate;

a force generator connected to the stage, the force generator moving the stage;

a movable member that is allowed to move in response to a reaction force generated by at least one of a movement of the stage and the force generator; and

at least one support system that support the movable member, the at least one support system having a plurality of supporting parts to allow the movable member to move relative to a stationary surface.

83. (New) The stage assembly of claim 82, wherein the supporting parts include a first bearing part having a planar layer and a second bearing part having a spherical layer.

84. (New) The stage assembly of claim 83, wherein the force generator moves the movable member along a first axis, and the planar layer allows the movable member to move linearly along the first axis.

85. (New) The stage assembly of claim 83, wherein the at least one support system includes a top flat surface, and the spherical layer allows the top flat surface to conform to an undersurface of the movable member.

86. (New) The stage assembly of claim 83, wherein the at least one of the first bearing part and the second bearing part comprises one of a pneumatic bearing, magnetic bearing, and mechanical bearing, and a combination thereof.

87. (New) The stage assembly of claim 82, wherein the movable member has an upper side that supports the stage.

88. (New) The stage assembly of claim 87, wherein the at least one support system includes a top flat surface, and the supporting parts include a bearing part having a planar layer that allows the movable member to move linearly and a conforming part that allows the top surface to conform to an undersurface of the movable member.

89. (New) The stage assembly of claim 88, wherein at least one of the supporting parts comprises one of a pneumatic bearing, magnetic bearing, and mechanical bearing, and a combination thereof.

90. (New) An exposure apparatus comprising:
an illumination system that irradiates radiant energy; and
the stage assembly according to the claim 82, the stage assembly disposing an object on a path of the radiant energy.

91. (New) A device manufactured with the exposure apparatus of claim 90.

92. (New) A wafer on which an image has been formed by the exposure apparatus of claim 90.